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OPEN SCIENCE: OPEN SOURCE LICENSES IN SCIENTIFIC RESEARCH

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In recent years, there has been growing interest in the area of open source software ("OSS") as an alternative economic model. However, the success of the OSS mindshare and collaborative online experience has wider implications to many other fields of human endeavor than the mere licensing of computer programmes. There are a growing number of institutions interested in using OSS licensing schemes to distribute creative works and scientific research, and even to publish online journals through open access ("OA") licenses. There appears to be growing concern in the scientific community about the trend to fence and protect scientific research through intellectual property, particularly by the abuse of patent applications for biotechnology research. The OSS experience represents a successful model which demonstrates that IP licenses could eventually be used to protect against the misuse and misappropriation of basic scientific research. This would be done by translating existing OSS licenses to protect scientific research. Some efforts are already paying dividends in areas such as scientific publishing, evidenced by the growing number of OA journals. However, the process of translating software licenses to areas other than publishing has been more difficult. OSS and OA licenses work best with works subject to copyright protection because copyright subsists in an original work as soon as it is created. However, it has been more difficult to generate a license that covers patented works because patents are only awarded through a lengthy application and registration process. If the open science experiment is to work, it needs the intervention of the legal community to draft new licenses that may apply to scientific research. This article will look at the issue of such OA licenses,

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paying special care as to how the system can best be exported to scientific research based on OSS and OA ideals.

I. INTRODUCTION

Recent years have witnessed an increase in the quantity and quality of studies dedicated to the economics of research and development for science and technology,[2] with particular interest paid to the economic study of the impact of intellectual property rights in the fostering of innovation.[3] Intellectual property ("IP") has been considered one of the most important drivers of new innovation in science and technology because it allows researchers, institutions, and inventors to recover their investment in the shape of limited monopolies to their ideas.[4] However, some authors have raised concerns that enhanced intellectual property protection may actually have adverse effects in the development of future research.[5] Basic research had usually not been considered to be subject to protection, and up until recently it was generally offered to the public in the shape of peer-reviewed journals. However, there is a growing trend towards excessive commercialisation and protection of scientific data, as illustrated in the case of the growing protection of the human genome.[6]

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[2] *See, e.g.*, M. P. FELDMAN, A. N. LINK & D. S. SIEGEL, THE ECONOMICS OF SCIENCE AND TECHNOLOGY: AN OVERVIEW OF INITIATIVES TO FOSTER INNOVATION, ENTREPRENEURSHIP, AND ECONOMIC GROWTH (Kluwer Academic 2002).

[3] *See* OVE GRANSTRAND, THE ECONOMICS AND MANAGEMENT OF INTELLECTUAL PROPERTY: TOWARDS INTELLECTUAL CAPITALISM (Edward Elgar ed., 1999); KEITH E. MASKUS, INTELLECTUAL PROPERTY RIGHTS IN THE GLOBAL ECONOMY (Institute for International Economics 2000).

[4] *See, e.g.*, Edwin Mansfield, *Patents and Innovation: An Empirical Study*, 32 MGMT. SCI. 173 (1986).

[5] Steve Bunk, *Researchers Feel Threatened by Disease Gene Patents*, 13 THE SCIENTIST 7 (1999); J. H. Reichman & Paul F. Ulhir, *Database Protection at the Crossroads: Recent Developments and Their Impact on Science and Technology*, 14 BERKELEY TECH. L.J. 793 (1999).

[6] John Sulston, *Intellectual Property and the Human Genome*, *in* GLOBAL INTELLECTUAL PROPERTY RIGHTS: KNOWLEDGE, ACCESS, AND DEVELOPMENT 61–73 (Peter Drahos & Ruth Mayne eds., 2002).

Because access to scientific data has become a requisite of modern research and development ("R&D"), there is growing concern that the trend towards commercialisation will translate into less available public academic research, which would therefore reduce the overall scientific output. These worries have prompted several studies and reports that attempt to address the problem of the dissemination of academic scientific research.[7] The area of biotechnology has been deemed to be of particular concern because of its significant economic potential; therefore, it has been the subject of a patenting rush of unprecedented proportions.[8] This phenomenon has prompted the release of genetic information into the public domain, which has also prompted fears of the misuse of the publicly available data by unscrupulous users, who will use this information to close and commodify research through excessively general patents.

These problems have motivated some to call for the devising and utilisation of new ways of protecting basic scientific research from potentially damaging commodification of knowledge.[9] One proposed solution is to use the novel intellectual property licensing model that has been successful in software development, generally known as OSS. This system uses intellectual property protection to ensure the wider dissemination of software, by maintaining the copyright protection over a work, and then distributing it using a license that allows further copying and redistribution of the work, ensuring that the wider community will have access to the

[7] *See, e.g.*, *An Economic Analysis of Scientific Research Publishing*, A Report Commissioned by the Wellcome Trust, Revised Edition (Oct. 2003), http://www.wellcome.ac.uk/assets/wtd003182.pdf; House of Commons Science and Technology Committee, Scientific Publications: Free for All?, 2003–4, H.C. 399-I, http://www.publications.parliament.uk/pa/cm200304/cmselect/cmsctech/399/399.pdf.

[8] GRAHAM DUTFIELD, INTELLECTUAL PROPERTY RIGHTS AND THE LIFE SCIENCE INDUSTRIES: A 20TH CENTURY HISTORY 51–74 (Ashgate Publishing Limited 2003).

[9] Stephen M. Maurer, *New Institutions for Doing Science: From Databases to Open Source Biology*, paper presented to the European Policy for Intellectual Property Conference on Copyright and database protection, patents and research tools, and other challenges to the intellectual property system (Nov. 24–25, 2003), http://www.merit.unimaas.nl/epip/papers/maurer_paper.pdf.

software's source code and allow its modification and dissemination. There are several open source and free software licensing models, but the common denominator in most of them is to allow access to the source code and to allow users to disseminate the code without restrictions.[10]

It is with regards to scientific research and innovation that the possibility of translating some of these open source models to the scientific research arena comes into play. The initial application of open source has been in the adoption of a scientific publishing model often referred to as OA. The OA movement can best be exemplified by the publication of scientific outputs and other materials online.[11] These results are offered online without subscription charges, allowing the wider scientific community access to high-quality content with the click of a button. However, open access is not enough to ensure access to scientific works because OA generally covers only those materials that are subject to copyright protection, such as journal articles. If scientists want to distribute their works using the open source model, then there would need to be some sort of license that allows the distribution of patented works, or works contained in scientific databases.

The solution would appear to be a simple matter of translating existing licenses to protect patented research, but this has proven to be much harder than previously expected.[12] It is very interesting that while there are new OA and open source licenses created every day, an open science license that protects research through patents and database rights has been slow in the making, despite

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[10] Andres Guadamuz, *Viral Contracts or Unenforceable Documents? Contractual Validity of Copyleft Licenses*, 26 EUR. INTELL. PROP. REV. 331 (2004).

[11] *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities*, Conference on Open Access to Knowledge in the Sciences and Humanities (Oct. 20–22, 2003), http://www.zim.mpg.de/openaccess-berlin/berlindeclaration.html.

[12] Kenneth Neil Cukier, *Open Source Biotech: Can a Non-Proprietary Approach to Intellectual Property Work in the Life Sciences?* 1 THE ACUMEN J. LIFE SCI. (2003), *available at* http://www.cukier.com/writings/opensourcebiotech.html.

the obvious enthusiasm from commentators, and extensive political will to generate such a license.[13]

There are many reasons for the difficulties encountered. Some have pointed out that the open source model does not work best with patented works,[14] because the model appears to be in conflict with the public interest justifications for patents, which imply that inventors are expected to recoup the investment they have incurred. It has also been remarked that the open source model works best with copyright works because they protect creations that are immediately awarded protection, while patented research requires a specific application to the research, making its dissemination through open licenses a more difficult endeavor.

The present article tries to respond and contribute to these developments by examining of the existing scheme to determine the efficacy of the movement and its application to all sorts of scientific research outputs. Then, the paper will present a suggestion for a new licensing model for patentable scientific research that allows access and dissemination to diverse fields of endeavor.

II. WHAT IS OPEN SOURCE?

There is considerable discussion about the different definitions and variations of what is generally understood as open source software, particularly because there is currently a divergence of opinion between different camps in whether one should use the terms "open source" or "free software" to define the movements implicit in the permissive distribution of software.[15] This is not the

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[13] Dan Burk, *Open Source Genomics*, 8 B.U.J. SCI. & TECH. L. 254 (2002).

[14] Robin Cooper Feldman, *The Open Source Biotechnology Movement: Is It Patent Misuse?* (2004) (unpublished manuscript, on file with Vol. 6 of MINNESOTA JOURNAL OF LAW, SCIENCE & TECHNOLOGY), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=545082.

[15] For one side of the debate, see Richard Stallman, *Why "Free Software" is better than "Open Source"* (1998), http://www.gnu.org/philosophy/free-software-for-freedom.html. This dispute has been exacerbated by the release of the latest version (version 3) of the influential General Public License ("GPL"). There seems to be a final split in the making between the open source and free

place to solve this dispute, but it should be said that agreeing on the terms is of significant importance to the nascent movement. Suffice it to say, there are different terms that can be used to describe the movement: Free Software ("FS"), Open Source Software ("OSS"), Free Open Source Software ("FOSS"), Free Libre Open Source Software ("FLOSS"), Open Code,[16] and non-proprietary software.[17] The reason behind the many different terms and definitions is mostly historical, and comes from the fact that each denomination, particularly FS and OSS, have become attached with specific philosophies and ideologies, and, moreover, each of these definitions will usually inform the type of licenses used to distribute the work.[18] This work will use the term "open source software" when talking specifically about the many different licenses used in software development.

In its widest possible sense, OSS is used to define a computer program that allows later modifications by the user or other developers by providing access to its source code[19] through the use of a permissive license. In this light, non-proprietary software is considered as such if it "is released with a license that would permit others to 'fork' the software and release their own modified versions without onerous restrictions, even though the copyright may remain in the hands of a single individual. At least in theory, control has been conceded."[20]

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software camps because Linus Torvalds has decided not to adopt the new version in the Linux Kernel. For an earlier discussion about the GPL v3, see Robert W. Gomulkiewicz, *General Public License 3.0: Hacking the Free Software Movement's Constitution*, 42 HOUS. L. REV. 1015 (2005).

[16] This is the term preferred by Lessig to avoid the FS/OSS debate. *See* LAWRENCE LESSIG, CODE AND OTHER LAWS OF CYBERSPACE 7 (Basic Books 2000).

[17] This term is the term preferred by the author. *See* Guadamuz, *supra* note 10, at 332.

[18] LAWRENCE E. ROSEN, OPEN SOURCE LICENSING: SOFTWARE FREEDOM AND INTELLECTUAL PROPERTY LAW 51–69 (1st ed. 2004).

[19] "Source code" are the programming statements in a programming language that exist before the program is compiled into an executable application. The executable form of the software is generally known as the object code, and can only be read by the machine.

[20] Wikipedia.com, Proprietary Software (2002), http://en.wikipedia.org/wiki/proprietary_software.

Beyond this basic definition, there are a few differences between the other terms, but they are generally referring to some core principles. In the strictest sense, the FS concept is centred on the idea of developing programs and distributing them freely.[21] Stallman defines free software as having four basic freedoms: the freedom to run the program; the freedom to study how the program works by giving access to the source code; the freedom to redistribute copies; and the freedom to improve and distribute improvements to the public.[22] As understood by the proponents of free software, programmers and other developers can charge for the software if it is their desire to do so, but the same underlying freedom behind the software must exist either if it is acquired for a fee or if it is not. The user must still be able to have all of the freedoms described, with access to the source code as the most basic requisite.[23]

These freedoms are protected by the adoption of a restrictive licensing model that makes use of existing copyright legislation that guards the source code from proprietary software developers who want to copy it, adapt it and include it in their own programs. This licensing model is exemplified in the General Public License ("GPL").[24]

Open source is closely related to Free Software development, but it does contain a different emphasis about the freedoms involved. The term open source was coined during a strategy meeting in February 1998 in Palo Alto California by a group of software developers with links to the Linux operating system.[25] The need to create a new term to define this viewpoint had become evident because, until then, the prevalent way to describe all output

[21] Tony Stanco, *We are the New Guardians of the World* (2001), http://lwn.net/2001/0531/a/guardians.php3. It is vital to note that the meaning of the word "free" in FS does not mean free as in having no price, but rather free as in "freedom," or as it is often stated in OS and FS circles, free must be understood as in freedom, not as in beer.

[22] The Free Software Definition, http://www.fsf.org/philosophy/free-sw.html.

[23] Selling Free Software, http://www.gnu.org/philosophy/selling.html.

[24] The text of the GPL can be found at http://www.gnu.org/copyleft/gpl.html.

[25] Open Source Initiative, *History of the OSI*, http://www.opensource.org/docs/history.html.

produced by the non-proprietary approach was by using the expression "free software," based mostly on the FS philosophy described. It was apparent to many software developers that this movement had a tarnished reputation in the business world as a result of the more radical ideas held by people linked to the FS. Open Source then is the opposite of "closed source," the traditional proprietary approach to software development in the commercial world. Closed source is software "in which the customer gets a sealed block of bits which cannot be examined, modified, or evolved."[26] The main idea behind open source is to provide software for which the source is available for examination, modification and peer-review. The official definition of OSS came out of the original meeting, and was based on the Debian Free Software Guidelines, a licensing model that accompanies the Debian GNU/Linux system, a Linux distribution.[27] This has generated an Open Source Definition ("OSD"), which includes a recommended set of clauses that an OSS license should contain.[28] These licenses are exemplified by the Berkley Software Distribution ("BSD"), the Apache License and the Mozilla Public License ("MPL").[29]

III. THE OPEN SCIENCE MOVEMENT

It has become increasingly common to see the term "open source" used to describe all sorts of fields of study outside of the software arena that gave rise to the concept.[30] The application of this term to other fields could be loosely described as the open licensing movement, which can be defined as the distribution of works protected through intellectual property with the use of

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[26] Keeping an Open Mind (Nov. 11, 2000), http://www.catb.org/~esr/writings/openmind.html.

[27] The guidelines can be found at http://www.debian.org/social_contract.html#guidelines.

[28] The OSD can be found at Open Source.org, *The Open Source Definition*, http://www.opensource.org/docs/definition.php.

[29] A list of approved licenses can be found at http://www.opensource.org/licenses/.

[30] *See, e.g.*, Sara Boettiger & Dan Burk, *Open Source Patenting*, 1 J. INT'L BIOTECHNOLOGY L. 11 (2004); Burk, *supra* note 13.

permissive "some rights reserved" licenses based on the principles reflected in open source licenses and definitions. Given the varied choice of terminology encountered in software development, the new licensing scheme could also receive different names, such as non-proprietary licenses, free licenses, or commons licenses. However, the preferred word to describe this disparate movement seems to be the use of the term "open." Superficially, there seems to be a good argument to choose the term "open source," as it is the one that is more readily identifiable by the public as a description of non-proprietary software models.[31] However, the term "open source" is problematic because the open source paradigm may not translate well into other fields because the original term was used to describe the availability of a computer programme's source code. Therefore, open source should not be used to identify licensing schemes that do not refer to software at all, and where there is no source code to be open. For example, a recent article in The Economist asks: "What does it mean to apply the term 'open source' in fields outside software development, which do not use 'source code' as a term of art? Depending on the field in question, the analogy with source code may not always be appropriate."[32]

Despite these misgivings, there would appear to be almost universal agreement about using the word "open" to describe a philosophical movement that shares the principles and objectives of the two main non-proprietary software camps. The use of these ideals in the area of scientific research presents the birth of a new movement that could be called "open science." This movement could be defined as the application of open source licensing principles and clauses to protect and distribute the fruits of scientific research. This can be done by applying the OSS model to protect other works in areas as varied as biotechnology, biodiversity databases, traditional knowledge, and medical research. Non-proprietary and OA models would be an excellent

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[31] As a measure of the prevalence of open source over other terms, Google throws 337,000 results for "non-proprietary," 19,000,000 results for "free software," and 23,600,000 for "open source."

[32] *An open-source shot in the arm*? ECONOMIST, June 10, 2004, *available at* http://www.economist.com/displaystory.cfm?story_id=2724420.

option to maintain a body of technological knowledge that can be shared without fear of misappropriation by commercial interests, access to the protected technologies. According to Maurer, open science is thus defined: "Open science is variously defined, but tends to connote (a) full, frank, and timely publication of results, (b) absence of intellectual property restrictions, and (c) radically increased pre- and post-publication transparency of data, activities, and deliberations within research groups."[33]

The suggested definition of open science can be used to cover the many different types of scientific outputs described, but there are two main areas of output that are being discussed in the literature as subject to the potential adoption of open licenses. These are the scientific publishing and the scientific output, such as databases and patented inventions. The first is embodied in the open access movement; the second is better exemplified in the so-called open biotechnology movement.

A. Open Access

The term "open access" has become prevalent in the literature in recent years to identify works that are freely available over the internet (using free in the "freedom" sense). These works will generally be distributed by maintaining their copyright—although the term should be generic enough to define works that have been released into the public domain. OA then will be any work that has been offered under a permissive license that allows the redistribution of the work.

More specifically, OA has gained some very specific connotations because it is used to refer to academic journals and some forms of academic publication through the use of such licenses. This is evidenced by the many different conferences and symposia that have been organised to provide a theoretical framework to OA, which has resulted in the influential Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities,[34] the Budapest Open Access Initiative ("BOAI"),[35] the

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[33] Maurer, *supra* note 9.

[34] The full text of the declaration can be found at http://www.zim.mpg.de/openaccess-berlin/berlindeclaration.html.

Bethesda Statement on Open Access Publishing,[36] and also the European Cultural Heritage Online ("ECHO") Charter.[37] Of these, one of the most cited definitions is that of the Berlin Declaration, which defines open access as: "a comprehensive source of human knowledge and cultural heritage that has been approved by the scientific community . . . . Open access contributions include original scientific research results, raw data and metadata, source materials, digital representations of pictorial and graphical materials and scholarly multimedia material."[38]

This definition is very narrow, as it only accepts as OA those works approved by the scientific community, which seems to imply that a form of peer-review is required. In similar fashion, the BOAI defines OA in light of peer-reviewed and scholarly publications, but it allows for the publishing of materials that have not been reviewed for the purpose of comments. The BOAI states that OA covers literature which is published in "peer-reviewed journal articles, but it also includes any unreviewed preprints that they might wish to put online for comment or to alert colleagues to important research findings."[39]

Still, most of the definitions in the declarations tend to be very narrow.[40] Philosopher and OA advocate, Peter Suber, proposes a more open definition, which states that:

> "Open access" (OA) is free online access. OA literature is not only free of charge to everyone with an internet connection, but free of most copyright and licensing restrictions. OA literature is barrier-free literature produced by removing the price barriers and permission

[35] More about the initiative can be found at Budapest Open Access Initiative ("BOAI"), http://www.soros.org/openaccess.

[36] *See* Bethesda Statement on Open Access Publishing, http://www.earlham.edu/~peters/fos/bethesda.htm.

[37] *See* European Cultural Heritage Online, http://www.ling.lu.se/projects/echo/contributors/charter.html.

[38] *See Berlin Declaration on Open Access to Knowledge in the Sciences & Humanities*, *supra* note 11.

[39] BOAI, *supra* note 35 (follow hyperlink "read the initiative").

[40] For another narrow definition, see Directory of Open Access Journals ("DOAJ"), http://www.doaj.org/articles/questions#definition.

> barriers that block access and limit usage of most conventionally published literature, whether in print or online.[41]

This definition tends to be more in line with the sharing ethos[42] that gives birth to open source software, and therefore it is more in line with the intellectual, legal, and ideological parent of open access. While it must be said that there is an argument to be made in favour of quality control of scholarly research, the movement could benefit from further dissemination of other content offered online.

The growth of OA journals is undeniable. At the moment of writing, the Directory of Open Access Journals ("DOAJ")[43] listed almost 2000 OA journals in all categories of scientific research, with estimates that at least thirty new journals are being added to the DOAJ every month. Figures such as these tend to indicate that this model may very well be the future of academic publishing, particularly for academic journals.

Initially, one could be suspicious about the academic and economic viability of the model, but this is being disputed by the existing research. Some studies, for example, indicate that journals that are available online have wider circulation and are more cited than more prestigious journals. A study of 119,924 conference articles in computer science found that the most cited articles were significantly most likely to come from journals available online than from offline journals by an average of 336%.[44] Another study in the United States has found that online journal publishing is economically sustainable under the present system because the revenue obtained by each published article from the publisher is equal to the cost of producing the article, which removes the economic recuperation justification. The study points out that

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[41] Peter Suber, *Creating an Intellectual Commons through Open Access* (May 28, 2004), http://dlc.dlib.indiana.edu/archive/00001246/01/suberrev052804.pdf.

[42] *See* Andres Guadamuz, *The 'New Sharing Ethic' in Cyberspace*, 5 J. WORLD INTELL. PROP. 129 (2002), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=569111.

[43] *See* Nature WebDebates, http://www.doaj.org.

[44] Steve Lawrence, *Free online availability substantially increases a paper's impact*, NATURE (May 31 2001), *available at* http://www.nature.com/nature/debates/e-access/Articles/lawrence.html.

"[t]he monetary cost of the time that scholars put into the journal business as editors and referees is about as large as the total revenue that publishers derive from sales of the journals."[45] This statement is corroborated by more recent research that concludes that open source journals are increasing in numbers because they are able to be financed by different types of funding sources, including author fees, conference hosting, and the provision of value-added services.[46]

B. Open Biotechnology

One of the best areas to explore the open science movement is the field of biotechnology research and the creation of open biotechnology, which can be defined as a sub-section of open science. To understand the application of open source models to the field of biotechnology, one must understand the race to sequence the human genome.[47] During the 1990s, there were several groups attempting to decode the human genome, but most of the public efforts were brought together in 1996 with the creation of the International Human Genome Sequencing Consortium ("the Consortium"), a collection of researchers from around the world.[48] These efforts were geared towards the principle of sharing the information obtained by the participants with the common goal of classifying the totality of human genetic sequences, exemplified by the "Bermuda Principles."[49] The Principles clearly specified that the results of the research would be placed in the public domain as soon as possible. The Human

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[45] Andrew Odlyzko, *The Economics of Electronic Journals*, 2 FIRST MONDAY (1997), *available at* http://firstmonday.org/issues/issue2_8/odlyzko/index.html.

[46] John Willinsky, *Scholarly Associations and the Economic Viability of Open Access Publishing*, 4 J. DIGITAL INFO. 177 (2003), *available at* http://research2.csci.educ.ubc.ca/eprints/archive/00000004/01/?printable=1.

[47] For a comprehensive account of the race for the human genome, see Sulston, *supra* note 6, at 61–73.

[48] These included the Wellcome Trust, the UK Medical Research Council, the U.S. National Center for Human Genome Research, the German Human Genome Programme, the European Commission, the Human Genome Organisation, and the Human Genome Project of Japan.

[49] For a summary of both meetings, see Doegenomes.org, http://www.ornl.gov/hgmis/research/bermuda.html.

Genome Organisation ("HUGO") was made responsible for coordinating the data and for using the internet for its release.

Despite the early spirit of sharing exemplified by the Consortium and by the Bermuda Principles, some firms started looking at the possibility of commercialising the results. In 1998, a member of the Consortium created the company Celera Genomics, which set off immediately to finish a sequence of the human genome before the Consortium did.[50] Celera eventually would fail in achieving the full genome first, even though there was growing suspicion that they were using parts of the publicly made material by the Consortium in order to boost their research. In the year 2000, a joint statement by the two participants was made public, announcing that there was an initial draft of the full human genome,[51] and the results from the public sector have already been made public in several websites.[52] However, in 2001 the contending parties published their respective results at the same time, and while the Consortium claimed that Celera had copied their published results, Celera refuted the claims.[53] Without going into the details of these controversial claims and counter-claims, it is clear that the race itself worried some public-sector researchers about the possible abuse of publicly available information that could be used later on to make broad patent claims and commodify the biological data offered.[54] This fear seemed to be corroborated by the facts that by 1999, Celera had applied for the patenting of

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[50] Sulston, *supra* note 6, at 64–65.

[51] Human Genome Project, *International Human Genome Sequencing Consortium Announces "Working Draft" of Human Genome*, Human Genome Project press release, June 2000, http://www.nih.gov/news/pr/jun2000/nhgri-26.htm.

[52] A good collection of these can be found at http://www.ensembl.org/index/html.

[53] To contrast both views, see R. Waterston, E. Lander & J. Sulston, *On the sequencing of the human genome*, 99 PROC. NAT'L ACAD. SCI. 3712 (2002); E. Myers et al., *On the sequencing and assembly of the human genome*, 99 PROC. NAT'L ACAD. SCI. 4145 (2002).

[54] Ken Howard, *The Bioinformatics Gold Rush*, 283 SCI. AM. 58 (2000), *available at* http://www.cvcaroyals.org/~rluker/pdf_files/Genomic_Business.pdf.

6500 human gene sequences, and by 2000 it had been awarded 300 patents.[55]

The state of affairs in biotechnology patenting generates considerable problems for those involved in this area, as excessive patenting threatens to hinder collaboration and research considerably because it generates an environment where researchers live in constant fear of litigation. A study conducted in 2002 found that researchers working in the area of genetics have significantly reduced normal academic collaboration practices due to fears about patent infringement, amongst other reasons.[56]

Similarly, overly broad gene patents could be used to attempt to gain a foothold in the market and stifle competition in the nascent biotechnology industry. Small research centres, educational institutions, and individual researchers may find it difficult to conduct research for fear of becoming involved in costly patent litigation. Moreover, even if a biotechnology patent has been erroneously granted, stakeholders and researchers would still need to get involved in a lengthy procedure to cancel the invalid patent, further stifling research.[57] A decrease in the practice of sharing biotech research could have nefarious consequences to the field, as the exchange of data held in different databases could be hindered.[58]

This is where open biotechnology has been suggested as a possible tool to foster the exchange of research and the transfer of technology amongst researchers all over the world. The general idea behind open biotechnology is to protect the fruits of scientific research by using non-proprietary licenses—particularly copyleft ones. The research would be made available to the public online

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[55] Heather Kent, *Benefits of genetic research must be shared, international genome organization warns*, 162 CANADIAN MED. ASS'N J. 1736 (2000), *available at* http://www.cmaj.ca/cgi/reprint/162/12/1736.

[56] D. Blumenthal et al., *Data Withholding in Academic Genetics*, 287 J. AM. MED. ASS'N. 477 (2002).

[57] L. Andrews, *The Gene Patent Dilemma: Balancing Commercial Incentives With Health Needs*, 2 HOUS. J. HEALTH L. & POL'Y 65 (2002).

[58] Nicholas Thompson, *May the Source Be With You*, WASHINGTON MONTHLY, (July/Aug. 2002), http://www.washingtonmonthly.com/features/2001/0207.thompson.html.

with an attached license that allows further uses of the material, but forbids the commercialisation of the research by threatening to enforce the intellectual property rights that protect them. This strategy would be compatible with the existing ethos of sharing research that exists in the scientific community. Talking about the possible use of the open source model in the field of bioinformatics, scientist Ewan Birney from the European Bioinformatics Institute commented that "[f]or us, it's straight scientific principles. If you want to be a scientist, open up your data and open up the code that helps you work with that data."[59]

The first effort to implement this idea was undertaken by Tim Hubbard of the Sanger Institute in the United Kingdom, which was involved in the Human Genome Project. Hubbard became interested in open source and open content licenses, until he realised that the model could be used to protect human genome research.[60] Although Hubbard drafted a license, the idea was never implemented by the Sanger Institute because all of the materials were being released into the public domain and could not be licensed. John Sulston, a prominent voice in the genetic research community, has provided some sobering comments about the fact that protecting scientific works intended for public dissemination with a license is contrary to the ethos behind such undertaking.[61] The idea is to make the works available to the public, not to tie them up in legal battles and complex patent suits.

After this initial disappointment, there have been a few other suggestions about the use of the OSS model to protect the public results of the biotechnology research, although the implementation of such ideas has been minimal.[62] The failure to produce a viable movement is made more evident when the open biotechnology idea is contrasted with the aforementioned open source software and OA models, which have been hugely successful by all

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[59] Sam Williams, *I Hack the Body Electric*, O'REILLY NETWORK, (July 25 2002), http://www.oreillynet.com/lpt/a/2580.
[60] Cukier, *supra* note 12.
[61] Sulston, *supra* note 6, at 64.
[62] Burk, *supra* note 13.

measures.[63] In contrast, the implementation of an open biotechnology or open health license has been slow. There is no shortage of suggestions and positive press about the possibilities of open biotechnology, but these have not produced particularly concrete efforts.[64]

Nevertheless, there is one particular area of open biotechnology that has been successful, and that is the area of bioinformatics. Bioinformatics is the application of information technology to solve biological problems.[65] Bioinformatics projects can use all sorts of software, but it has been increasingly likely to see open source software as a favoured tool.[66] Nevertheless, the relative success of bioinformatics has more to do with the success of open source software than with the application of open biotechnology.

Another success story in open science is the Center for the Application of Molecular Biology to International Agriculture ("CAMBIA"),[67] which is an organisation that is attempting to solve many of the problems open science has faced by the judicious use of intellectual property "work-arounds" in the areas of agriculture, food security, biotechnology, and the environment.[68] This is done through several IP specific proposals:

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[63] For more about the success of the movement, see STEVEN WEBER, THE SUCCESS OF OPEN SOURCE (Harvard Univ. Press 2004).

[64] *See*, *e.g.*, R. Carlson, *Open-Source Biology and Its Impact on Industry*, SPECTRUM ONLINE, (May 2004), http://www.kurzweilai.net/meme/frame.html?main=/articles/art0613.html.

[65] Wikipedia.com, "Bioinformatics," http://en.wikipedia.org/wiki/Bioinformatics.

[66] *See, e.g.*, S. Dudoit, R.C. Gentleman & J. Quackenbush, *Open source software for the analysis of microarray data*, 34 BIOTECHNIQUES S45 (2003), *available at* http://papakilo.icmb.utexas.edu/cshl-2005/papers/Sandrine_bioconductor.pdf; T. Hubbard et al., *The Ensembl genome database project*, 30 NUCLEIC ACIDS RES. 38 (2002), *available at* http://nar.oxfordjournals.org/cgi/reprint/30/1/38.

[67] The centre can be found at http://www.cambia.org.

[68] C. Dennis, *Biologists launch 'open-source movement*,*'* 431 NATURE 494 (2004).

(1) A portal called Biological Innovation for the Open Society ("BiOS"), which brings together a number of open biotechnology efforts.[69]

The BiOS patent database includes 1,500,000 life-science patents from the different jurisdictions, which will allow researchers to look for possible patented materials in their area of research, allowing them to avoid costly litigation at a later date.[70]

(2) CAMBIA has applied and obtained twelve patents of biologic material in different patent offices around the world.[71]

(3) Bioinformatics tools offered through a research portal called BioForge.[72] This repository will host diverse projects that operate in a similar manner to open source software projects, providing a place to bring together researchers.

This is an encouraging step that will hopefully reverse the relative slow rate of progress in open biotechnology. This is because there are now some workable licenses within the BiOS project. These will be discussed in detail in the next section.

IV. THE LICENSING PARADIGM

One of the problems exposed by the open access debate is that there is significant misuse and misunderstanding of the terms and definitions involved. It is common to read terms such as "free software," "commons," "open source," and "public domain" interchangeably. There must be an understanding that besides the ideological and philosophical connotations of each term, the heart

[69] *See* CAMBIA, http://www.cambia.org/daisy/bios/home.html.

[70] *See* CAMBIA, *Patent Lens*, http://www.cambia.org/daisy/patentlens/patentlens.html.

[71] CAMBIA, *Intellectual Property*, http://www.cambia.org/daisy/cambia/intellectual_property.html.

[72] Based on the successful open source software project repository and portal called SourceForge. BioForge can be found at https://www.bioforge.net/.

of the movement is the distribution of intellectual works through permissive licenses.

The open licensing model is centered on the licenses; without them, the movement is just a project management technique. The free software and open source software movements have shown the way to follow regarding licensing agreements. The starting point for non-software licenses will be to learn from the experiences in non-proprietary software development.[73] However, there should be an understanding that these licenses are just a starting point, as OSS licenses tend to be specific to software development and, in many instances, they have been drafted by software engineers with little or no intervention of the legal community.[74] Furthermore, some software developers appear to display considerable reluctance about external intervention in the decision process regarding licensing decisions.[75] This section takes a closer look at the attempts to translate the OSS ideals to the needs of scientific research.

A. Open Access Licenses

Open access publishing tends to use "some rights reserved" licenses in order to distribute the academic materials involved. These may include the use of standard licenses, or in some instances, it may include the use of customised licenses. At the

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[73] For literature that deals directly with FOSS licenses, see R. Gomulkiewicz, *De-Bugging Open Source Software Licensing*, 64 U. PITT. L. REV. 75 (2002); D. Ravicher, *Facilitating Collaborative Software Development: The Enforceability of Mass Market Public Software Licenses*, 5 VA. J.L. & TECH. 11 (2000); D. Kennedy, *A Primer on Open Source Licensing Legal Issues: Copyright, Copyleft and Copyfuture*, 20 ST. LOUIS U. PUB. L. REV. 345 (2001), *available at* http://law.slu.edu/journals/plr.html; C. Nadan, *Open Source Licensing: Virus or Virtue*, 10 TEX. INTELL. PROP. L.J. 349 (2002).

[74] Richard Stallman is generally attributed as the author of the GPL, but Professor Eben Moglen provided legal assistance. *See* GLYN MOODY, REBEL CODE: LINUX AND THE OPEN SOURCE REVOLUTION 26 (Penguin 2002).

[75] Prodromos Tsiavos, *The (dis)illusions of a rebel: A reappraisal of the General Public License through techno-organizational analysis*, Presented at the 19th *BILETA Annual Conference*, University of Durham (Mar. 25–26, 2004).

time of writing, the most prevalent open access distribution scheme is through Creative Commons ("CC") licenses.[76]

The Creative Commons project attempts to create so-called "intellectual property conservancies,"[77] separating a block of human knowledge offered for the benefit of the public, but still protected by intellectual property. This is analogous to nature conservation areas that exist for the wider social benefit, but have restrictions on certain uses. In the Creative Commons, the goal of intellectual property conservancies is achieved through the offering of a wide variety of licenses to protect creative works from misuse. This is done through the application of open source principles, where the work retains its copyright protection, but it is distributed freely[78] as long as the conditions contained in the license are met. The interesting part of the CC licensing environment is that it empowers users because there is a wide range of licenses to choose from. Creators and authors need only to go to a website and select from different options offered in a few drop-down menus; the system then chooses the license that fits the parameters entered. These licenses range from offering the work straight into the public domain, to more complex licenses with restrictions as to the commercial distribution of the work and the use of licenses in such distributions.[79]

Creative Commons licenses maintain a minimum set of standards that are met by all of their offered legal documents, with the exception of the one that offers the work to the public domain. This could be called the Creative Commons Definition, but it is

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[76] For example, the Public Library of Science ("PLoS"), one of the largest open access journal collections, is published through a CC license.

[77] Creative Commons, *Legal Concepts*, http://creativecommons.org/learn/legal/.

[78] In the Free Software sense.

[79] For more about Creative Commons, see Charlotte Waelde, et al., *The Common Information Environment and Creative Commons*, Final Report to the Common Information Environment Members of a study on the applicability of Creative Commons Licences (2005), *available at* http://geeklawyer.org/ccreport.pdf.

generally known as the CC Baseline Rights.[80] All CC licenses provide these baseline rights:

> Licensors retain their copyright; this explains why the baseline rights do not apply to public domain offerings.
>
> The licenses announce that fair use rights are not affected by the license. This is a curious statement, as it should be assumed that any clause that erodes acquired fair use or fair dealing rights should be specified in the license.
>
> Licensees will have to obtain specific permission to perform one of the acts restricted by the license. For example, if the license does not allow modification or adaptation of a work, this action could only be performed with the permission of the owner. This seems to be a redundant statement, as this is an action that is usually understood in all licenses.
>
> Copyright notices should not be removed from all copies of the work.
>
> Every copy of the work should maintain a link to the license.
>
> Licensees cannot alter any terms of the license. This seems to be yet another redundant clause, as it should be understood that this is common licensing practice.
>
> Licensees cannot use technology to restrict access to the work. This baseline right specifically forbids the use of technical protection measures.[81]
>
> Licensees are granted the right to copy, distribute, display, digitally perform and make verbatim copies of the work into another format.
>
> The licenses have worldwide application, last for the entire duration of copyright (unless otherwise specified), and are irrevocable.[82]

It is important to note that the baseline definition of CC licenses does not mention anything about modification or adaptation of a work, does not deal with copyleft-like clauses requiring the use of similar licenses to distribute the work, does not mention attribution, and does not deal with the distribution of copies for commercial purposes. This makes the basic Creative Commons definition more akin the open source ideals than to the

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[80] *See* Creativecommons.org, *Baseline Rights*, http://creativecommons.org/about/licenses/ [hereinafter Baseline Rights].

[81] For more about technical protection measures, see Severine Dusollier, *Electrifying the Fence: The Legal Protection of Technological Measures for Protecting Copyright*, 21 EUR. INTELL. PROP. REV. 285 (1999).

[82] *See Baseline Rights*, *supra* note 80.

free software principles exemplified by the GPL.[83] Nevertheless, creators can choose a CC license that maintains all of the restrictions mentioned, from all of the options offered. Authors then can choose from the following options to generate their license:[84]

> *Attribution:* The work is made available to the public with the baseline rights, but only if the author receives proper credit.[85]
>
> *Non-commercial:* The work can be copied, displayed and distributed by the public, but only if these actions are for non-commercial purposes.
>
> *No derivative works:* This license grants baseline rights, but it does not allow derivative works to be created from the original.
>
> *Share-Alike:* This is based on copyleft principles. Derivative works can be created and distributed based on the original, but only if the same type of license is used, which generates a viral license.[86]

It is possible to have licenses that combine several of these options.[87] The strongest (and most popular) CC license is the Attribution Non-Commercial Share Alike License,[88] which is the license that most resembles the strongest copyleft software ones (such as the GPL). All CC licenses are presented in three formats: the first is a short and easy to read "Commons Deed," which explains the terms and conditions of the license in a simple manner; the second format is the "Legal Code," which is the full license; and the third is the "Digital Code," which provides an HTML version of the license[89] that can be read by search engines

[83] Guadamuz, *supra* note 10, at 333–34.

[84] For more about the CC license elements, see http://creativecommons.org/about/licenses.

[85] Starting with Creative Commons version 2.5, the Attribution element is factually a baseline right and not an element that can be chosen or not. *See* Creativecommons.org, *Choosing a License*, http://creativecommons.org/about/licenses/.

[86] For more about the concept of viral contracts, see Margaret Jane Radin, *Humans, Computers, and Binding Commitment*, 75 IND. L.J. 38 (2000).

[87] However, the No Derivative and the Share-Alike elements are exclusive.

[88] Version 2.0 can be found at Creative Commons.org, *Commons Deed*, http://creativecommons.org/licenses/by-nc-sa/2.0/.

[89] To be more specific, the code uses Resource Description Framework ("RDF") metadata. For more about RDF, see W3C Technology and Society Domain, *Resource Description Framework (RDF)*, http://www.w3.org/RDF/.

and makes it easier to list the content in the Creative Commons directory.

Creative Commons presents a very positive step towards the wider distribution of non-proprietary technology. It is innovative, thoroughly planned and smartly implemented. CC delivers open access licenses in the digital domain with scalability, adaptability, and ease of use for those unfamiliar with the legal issues involved in licensing. CC also offers jurisdiction-specific versions of their licenses to make them more valid in an international environment and to respond to legal requirements in a given country.

The other major open content license is the GNU Free Documentation License ("GFDL"),[90] which is the FSF's non-software license, and it is generally used to protect manuals and other literature related to the FS movement. However, the GFDL is also used in other open access projects, such as the free online encyclopedia Wikipedia. The GFDL could be classified as an open access license because it allows the copying, distribution and adaptation of a work, provided the author complies with the conditions included. These can be found in section two of the license, which states:

> You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no other conditions whatsoever to those of this License.[91]

This is an important point of the license, because it specifies that it allows for the commercial use of the works. The GFDL allows for the modification and translation of the work, provided some specific sections are maintained or deleted; and all derivative works must be licensed using the GFDL.[92] This clearly means that this is a copyleft license, perpetuating itself through this viral clause. The viral nature of the license exists in section 4, which states that "[y]ou may copy and distribute a Modified Version of

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[90] The full text of the license can be found at The GNU Operation System, *GNU Free Documentation License*, ("GFDL") http://www.gnu.org/copyleft/fdl.html.
[91] *Id.* § 2.
[92] *Id.* § 4.

the Document . . . provided that you release the Modified Version under precisely this License . . . ."[93] This is different from the share-alike element in CC licenses, as these require only that the work is released with a license that contains similar clauses and rights.

The viral nature of the GFDL can be seen in practice through the wide copying and dissemination of Wikipedia articles, which are being used by many other open content providers, such as the Free Dictionary.[94] The articles found in this online resource have to be licensed through the GFDL, allowing yet another third party to copy them and use them in their website, provided that they use the GFDL.

With so many creative works that may be subject to protection by OA licenses, it should come as no surprise that there has been a recent proliferation of licenses that allow commercial and non-commercial content creators to adopt the non-proprietary open access model. One such project is the Open Content License ("OPL"), a collaborative effort that sets a copyleft license, ensuring that shared works will continue to remain free to subsequent users.[95] Similar efforts also include music creation via the Open Audio License ("OAL"),[96] the SCRIPT-ed Open License ("SOL"),[97] and even Open Cola, the world's first copyleft fizzy drink.[98]

Looking at the vibrant nature of the OA movement and the publication of scientific materials in journals or through other online means, it is clear that there are enough reasons to believe that some part of the open science movement is doing quite well

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[93] *Id.*

[94] *See* The Free Dictionary by Farlax, http://encyclopedia.thefreedictionary.com/.

[95] The license can be found at Open Content License ("OPL"), http://www.opencontent.org/opl.shtml.

[96] *See* Electronic Frontier Foundation—Defending Freedom in the Digital World, http://www.eff.org/IP/Open_licenses/eff_oal.php.

[97] *See* SCRIPT-ed Open Licence ("SOL"), http://www.law.ed.ac.uk/ahrb/script-ed/sol.htm.

[98] *See* Graham Lawton, *The Great Giveaway*, NewScientist.com, *available at* http://www.newscientist.com/hottopics/copyleft/copyleftart.jsp.

through the creation of growing body of work that is easily accessible to researchers around the world. However, what happens with scientific research that is not subject to publication? Can scientific databases, archives, repositories, and patented research be protected through open licenses?

B. Open Science Licenses

All of the aforementioned licenses have one thing in common—they protect only works that are subject to copyright. This is valuable when one considers that a significant amount of basic scientific works is protected by copyright, particularly academic journal articles and other literary works. This raises the question of whether there can be open licenses that protect other types of work in commercially viable fields like biotechnology and health research—which are usually available through databases or patents. This has proven to be difficult because, although there have been many scientists and researchers advocating the implementation of open licensing models to the scientific arena, it is difficult to find a patent or database equivalent to the GFDL or the Creative Commons licenses.

The reason for this is that the open license model works better with copyright than with patents or databases. There are two main reasons for this. First, copyright subsists in an original work as soon as it is fixed in tangible form.[99] Second, copyright does not require any sort of registration to initiate protection, which means that copyright "flows from the nib of a pen,"[100] making it much easier and cheaper to distribute through an open license as soon as it is originated. On the other hand, works that require registration to be subject to protection—such as patentable scientific research—will be more difficult to distribute through an open license, as several steps are required to distribute it with some sort of permissible licensing model.

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[99] Berne Convention on Literary and Artistic Works, art. 2 (Sept. 9, 1886) *available at* http://www.law.cornell.edu/treaties/berne/overview.html.

[100] P. Cohen & T. Ryan, *Copyright Law and the Internet*, http://info.utas.edu.au/docs/info/utas88/Peter.Cohen.html.

Although the specific difficulties of providing a patent solution will be discussed in more detail later, there has been some success in applying limited open science solutions for databases and patented works. These efforts are listed next.

1. Database Licenses

The importance of scientific databases for research is an issue that has been well explored in the existing literature.[101] There can be little doubt that in the information age, access to the vast amount of scientific data stored in databases is of utmost importance for researchers around the world. Access to a large number of databases is offered for a fee by a vast array of service providers and institutions.[102] The growth in the number and the economic importance of scientific databases has been accompanied by increased concerns about the reuse of the data to provide further works of commercial value. A report by the National Research Council in the United States points out that:

> Currently many for-profit and not-for-profit database producers are concerned about the possibility that significant portions of their databases will be copied or used in substantial part by others to create "new" derivative databases. If an identical or substantially similar database is then either redisseminated broadly or sold and used in direct competition with the original rights holder's database, the rights holder's revenues will be undermined, or in extreme cases, the rights holder will be put out of business. Besides being unfair to the rights holder, this actual or potential loss of revenue may create a disincentive to produce and then maintain databases, thus reducing the number of databases available to others.[103]

This is of particular worry for those who are releasing genetic data into the public domain, as described earlier. With publicly available databases, commercial providers would find large sections of readily available information that can be repackaged

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[101] *See, e.g.*, William M. Gelbart, *Databases in Genomic Research*, 282 SCIENCE 659 (1998); Steve Lawrence & Lee Giles, *Accessibility of Information on the Web*, 400 NATURE 107 (1999).

[102] *See* NATIONAL RESEARCH COUNCIL, A QUESTION OF BALANCE: PRIVATE RIGHTS AND THE PUBLIC INTEREST IN SCIENTIFIC AND TECHNICAL DATABASES, 40–51 (National Academy Press 1999).

[103] *Id.* at 14.

and resold as part of a commercial database. This possibility is precisely what has prompted the calls to protect databases through open source licenses.[104]

Despite the suggested application of the open source licenses and ideals to databases, the actual application has not been met with the enthusiasm that it deserves, which can be explained by two main reasons. Firstly, most non-commercial information—particularly in the field of biotechnology—is released into the public domain.[105] This type of release is extremely useful for future researchers, but it does little to curb the further commercialisation of the data.

Secondly, the legal protection of databases is a subject that is not fully harmonised at the international level, where different jurisdictions apply a wide range of legal figures and levels of protection to this type of intellectual work. For example, the United States[106] has been struggling with the application of copyright law to the subject of databases by extending the definitions of originality of a work. Earlier cases declared that the mere rearrangement of information was not enough to prove originality.[107] Despite the originality requirement, there are circumstances where the courts will award copyright protection to databases due to the fact that there is enough originality in what is done to the data.[108] Europe has followed a different path by embracing a "sweat of the brow" approach, where the work and investment that goes into the gathering and arranging of the data is rewarded, even if the data itself is not original,[109] which is

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[104] Maurer, *supra* note 9.

[105] *See*, *e.g.*, The GDB Human Genome Database, http://gdbwww.gdb.org/.

[106] For a more complete analyses of U.S. database protection, *see* Jennifer Askanazi et al., *The Future of Database Protection in U.S. Copyright Law*, 2001 DUKE L. & TECH. REV. 17 (2001); Jane Ginsburg, *Copyright, Common Law, and Sui-Generis Protection of Databases in the United States and Abroad*, 66 U. CIN. L. REV. 151 (1997).

[107] In particular, *see* Feist Publ'n v. Rural Tel. Co., 499 U.S. 340 (1991).

[108] This is made more evident in CCC Info. Serv. v. Maclean Hunter Mkt. Rep., 44 F.3d 61 (2d Cir. 1994).

[109] For more about database protection in Europe, *see* Catherine Colston, *Sui Generis Database Right: Ripe for Review?*, 3 J. INFO. L. & TECH. (2001), http://www2.warwick.ac.uk/fac/soc/law/elj/jilt/2001_3/colston/.

particularly evident with the European Directive on the legal protection of databases.[110] The Directive awards a *sui generis* right to databases in which there has been a quantitative and qualitative investment in obtaining or verifying the contained data.[111] However, this picture is made more complex by the recent rulings from the European Court of Justice,[112] which have eroded the database right considerably. To further erode the European database right, a report by the European Commission about the application of the right has produced negative results, and even the call to potentially eliminate it.[113]

It is precisely this complicated legal landscape that makes the possible application of open source software models so difficult for databases. It would seem possible that providers of scientific data contained in a database compiled in a country that provides for the copyright protection of databases (such as the United States), may be able to issue their work through an open access license, perhaps even a Creative Commons license. This would be possible because in most jurisdictions databases are protected as literary works.[114] However, those providers would first have to be able to be awarded protection in the first place, which is not always the case, as evidenced by the originality standards prevalent in the United States. In countries with a *sui generis* right, the licensing would have to meet with the very high requirements of the recent cases and the directive, which is not an easy task. According to Waelde and McGinley:

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[110] DIRECTIVE 96/9/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, Mar. 11, 1996, O.J. (L 077) (1996).

[111] *Id.* at art. 7(1).

[112] *See* Case C-203/02, British Horseracing Bd. v. William Hill, (2004) E.C.R.; Case C-338/02, Fixtures Mktg. Ltd. v. Svenska Spel, (2004) E.C.R.; Case C-46/02, Fixtures Mktg. Ltd v. OY Veikkaus, (2004) BAILII; Case C-444/02, Fixtures Mktg. Ltd. v. OPAP, (2004) BAILII.

[113] European Commission, *First Evaluation of Directive 96/9/EC on the Legal Protection of Databases* (Dec. 2005), http://europa.eu.int/comm/internal_market/ copyright/docs/databases/evaluation_report_en.pdf.

[114] *See, e.g.*, Copyright, Designs and Patents Act, 1988, § 3A (U.K.); Berne Convention, *supra* note 99, at art. 2.5.

> Suffice it to say many questions remain over the extent to which scientific databases might qualify for the sui generis right. Whereas at first blush it might have appeared that many might fall out with the necessary criteria, . . . it is far too early to argue that the contents of scientific databases fall into the public domain as a result of the ruling, however much that might benefit scientists and the progress of science.[115]

Taking into consideration all of these difficulties, it should come as no surprise that a large amount of online scientific data is still released into the public domain. Nevertheless, there are indications that the solution may not be found in database protection, but in contractual law. This is best evidenced by the International HapMap Project Public Access License ("HPPAL"),[116] which is part of the HapMap genetic database project. Unlike all other open licenses, the HPPAL does not assign any intellectual property rights; it is an end-user agreement. The data can only be accessed through following a registration process, where the user is required to agree to terms and conditions before gaining access to the certain parts of the HapMap genetic database.

The wording of the HPPAL makes it appear to be an intellectual property assignment of rights (it is after all, called a license), but it is not entirely clear what rights are held over the data that is being offered.[117] The HPPAL is very careful not to assign intellectual property rights, so it must be assumed that this is just a user agreement where the author enters into the obligation to comply with the terms and conditions set out in the document. Specifically, paragraph three of the license states that: "[y]ou may not access, copy, modify, sublicense, distribute or otherwise use

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[115] Charlotte Waelde & Mags McGinley, *Public Domain; Public Interest; Public Funding: Focusing on the 'Three Ps' in Scientific Research*, (2:1 *SCRIPT-ed* 83, 91 (2005)), *available at* http://www.law.ed.ac.uk/ahrb/script-ed/vol2-1/3ps.asp.

[116] To view the license, see International HapMap Project, http://www.hapmap.org/cgi-perl/registration.

[117] For more about genetic database protection, *see* Edward Baba, *From Conflict to Confluence: Protection of Databases Containing Genetic Information*, 30 SYRACUSE J. INT'L L. & COM. 121 (2003).

the Genotype Database or the data contained in it except as expressly provided under this License."[118]

The most relevant part of the HapMap license is with regards to future patent applications. Paragraph 2(b) of the license does not allow the patenting of genetic information from the database, with the exception of particular uses of sequences, provided that the patent allows further use of the information obtained from the database. The paragraph reads:

> [Y]ou shall not file any patent applications that contain claims to particular uses of any SNP, genotype or haplotype data obtained from the Genotype Database or any SNP, haplotype or haplotype block based on data obtained from, the Genotype Database, unless such claims do not restrict, or are licensed on such terms that that they do not restrict, the ability of others to use at no cost the Genotype Database or the data that it contains for other purposes; . . . .[119]

This is an attempt to provide a viral or share-alike element to the agreement, as if the freedoms protected by this license are protected in the future licensing of patented material. The HapMap license offers an ingenious way of getting around the problems of database protection enumerated above, as it relies on contractual obligations rather than on intellectual property protection, and may prove to be the way to go as far as database licenses are concerned.

2. Patent Licenses

If the application of open licensing to scientific databases has been minimal, the porting of OSS licenses to patented research has been almost nonexistent and doubly problematic for reasons that will be explored in more depth in the next section. Nevertheless, there have been a handful of attempts to provide a workable license for patented material, including a recent draft license.

One of the most promising efforts to provide a license has been put forward by the Creative Commons project. Because Creative Commons licenses are geared specifically towards creative works subject to copyright protection, a new concept has been designed

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[118] HapMap Project Public Access License, *supra* note 116, at para. 3.
[119] *Id.* at para. 2(b).

to accommodate scientific research. This concept is the Science Commons project,[120] which has been created to generate licenses that will deal with intellectual property works that are not covered by existing CC licenses. The project is ongoing at the time of writing, and it has yet to produce a license draft available to the public.

Another proposal is offered by Hubbard and Love, who explore some alternative models of pharmaceutical research and development to produce new medicines.[121] Their proposal uses the existence of free software as an illustration that alternative business models are viable, but unfortunately it fails to make the point of how to translate OSS licensing ideals into the pharmaceutical industry. Although Hubbard and Love's argument may not connect directly with OA models, their suggestion is important because they propose workable ways to fund the basic research and to generate incentives to companies to distribute their intellectual property to the public, which would be released through open licenses. But the question remains, which open licenses?

The answer to the question of licenses may lie in the aforementioned CAMBIA project. One of the most important parts of the objectives of CAMBIA is the use of open source ideals to generate a protected commons for researchers in the life sciences. This is done through a couple of licenses—the BiOS Plant Enabling Technology License and the BiOS Genetic Resource Technology License. These schemes can be used for specific types of patented material. According to the project, the licenses work like this:

> Instead of royalties, BiOS licensees must agree to legally binding conditions in order to obtain a license and access to the protected commons. These conditions are that improvements are shared, and that licensees cannot appropriate the fundamental "kernel" of the technology and improvements exclusively for themselves. Licensees

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[120] Science Commons, *Welcome to Science Commons*, http://creativecommons.org/projects/science/proposal.

[121] Tim Hubbard & James Love, *A New Trade Framework for Global Healthcare R&D*, http://www.pubmedcentral.nih.gov/picrender.fcgi?artid=340954&blobtype=pdf.

> obtain access to improvements and other information, such as regulatory and biosafety data, shared by other licensees. To maintain legal access to the technology, licensees must agree not to prevent other licensees from using the technology in the development of different products.[122]

The core concept of the BiOS Licenses is that they will be able to provide patented research with a permissive license that operates within OSS and open access principles. However, this is easier said than done, and the existing drafts demonstrate just how difficult it is to word open source patent licenses. Earlier drafts consisted of a single document that covered different types of patented technologies, particularly "Crop Molecular Enabling Technologies and associated patents, patent applications, know-how, data, materials, and business, technical, economical and manufacturing information."[123] However, the complicated nature of the subjects prompted a forking of the license to cover two different technologies, such as plant-enabling technologies and genetic resources technologies. While the subject and the specific application of both licenses are different, the legal principles and structure of both are the same, so they will be covered in the same way.

The first important common element of the licenses is that the patent owner always retains control over the technology, and what is established is a permissive chain of distribution. However, there is a possibility that that the licensor could be a licensee himself. The reason for this is because the BiOS Licenses contain a viral clause that allows licensees to sub-license the material, as long as the same rights that are contained in the license are preserved in the vertical agreement.[124] Paragraph 2.1 is the license grant, which gives licensees: "a worldwide, non-exclusive, royalty-free right and license to make and use the IP & Technology for the purpose

[122] CAMBIA, *Biological Innovation for Open Science, About BiOS (Biological Open Source) Licenses*, http://www.bios.net/daisy/bios/398.

[123] CAMBIA, *Biological Innovation for Open Science, About BiOS (Biological Open Source) Licenses*, *supra* note 122, at BIOS License version 1.1.

[124] CAMBIA, *Biological Innovation for Open Science, About BiOS (Biological Open Source) Licenses*, *supra* note 122, at para. 3.1 and subsections of both licenses.

of developing, making, using, and commercializing BiOS Licensed Products without obligation to CAMBIA, including a right to sublicense . . . ."[125]

Similarly, improvements to the patented technology are allowed as long as those are communicated to licensor, along with all improvement patent applications.[126] When compared to existing open source and open access licenses, the elements and clauses present in the BiOS License make it akin to a CC Attribution Commercial Share Alike license.

This is a worthwhile effort to create a viable "open source" license for patented materials. However, even in its draft stages it is easy to see that the language seems stretched and unclear in many instances—something that could turn away some potential licensors who could find the complex explanation of the terms and conditions difficult to navigate. Another question that arises from the draft is that it is not very clear what would be the role of the initial licensor and his place in a lengthy chain of sub-licensees. Paragraph 2.1.2 for example, states that:

> BiOS LICENSEE shall be responsible to ensure in said sublicenses that any Improvements produced by sublicensees are considered to be Improvements hereunder and that such sublicenses require the performance of all applicable obligations due to CAMBIA and other BiOS Licensees under this Agreement and any associated Agreements. BiOS LICENSEE shall provide a list of sublicensees to CAMBIA in writing at least once a year, which CAMBIA is entitled to post in CAMBIA's Protected Commons website (BioForge) or make available to BiOS Licensees.[127]

Does this really mean that the sub-licensee has some duty of care with regards to the actions of subsequent sub-licensees? How can such responsibility be exercised? Does this give the licensee the same rights and obligations as the licensor? What about the obligation to notify the licensor of any improvements? It would

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[125] CAMBIA, *Biological Innovation for Open Science, About BiOS (Biological Open Source) Licenses*, *supra* note 122, at para. 3.1 and subsections of both licenses.

[126] CAMBIA, *Biological Innovation for Open Science, About BiOS (Biological Open Source) Licenses*, *supra* note 122, at para. 3.2 of both licenses.

[127] CAMBIA, *BIOS Plant Enabling Technology License*, http://www.cambia.org/daisy/PELicense/751/382.

seem that this would fall into the obligations of the sub-licensee. Is the sub-licensee in any obligation to notify the original licensor?

It has been pointed out that the BiOS License is a work in progress and requires more fine tuning to be ready for consumption, so no further analysis of the drafts is wise at the moment when the final texts may change considerably in the near future. Nevertheless, the draft licenses as they exist are tremendously complex, they represent a considerable legal document, which small and medium research facilities are supposed to sign to with little or no legal assistance. The patent filed is subject to minute legal technicalities, and adding a complicated license to the equation may increase the legal uncertainty that already exists. Research centres may be tempted to simply stay away from all open licensing efforts to reduce their liabilities. But there are other inherent problems with patent licensing that make the porting of OSS extremely unlikely.

3. Trouble with Patents

The difficulties with the one existing patent license scheme and the lack of other open science licenses indicates that there appears to be an inherent problem in porting a licensing model that has been designed to work with copyright into a system that would have to work with patents.

There can be little doubt that patents offer the strongest short-term protection of technologies emanating from costly scientific research.[128] It has several advantages in order to protect certain technologies, particularly because some types of research may produce outputs that would not be suitable for copyright protection. While this is precisely how the commercial world operates, those interested in making their work available to the public under some sort of open license model will have to do it by protecting their work, as the entire system is based on the threat of infringement suits brought against those who had not shared the work according to the required clauses.

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[128] *See* Mansfield, *supra* note 4.

The problem then for some institutions wanting to release their research is that they will have to obtain a patent in order to license it. This can prove to be an expensive endeavor. Some studies estimate that an average biotechnology patent application could cost an average of $7,500 in the United States alone.[129] Because patents must be applied separately in each jurisdiction where they will be exploited,[130] the costs for a small research institution could be prohibitive. Even when the patent has been obtained, the enforcement of patents is where the costs are steeper. The cost of defending a patent in the United States where the dispute is less than a million dollars can range from $300,000 to $750,000.[131] This means that even if a research institution obtains a patent to protect their research, the right holders would find it extremely expensive to defend their intellectual property against misuse—particularly considering that those likely to use open source licenses may be small research institutions, or even individual researchers.[132] The problem would be more pronounced for researchers in developing countries, as they would possibly have to enforce patents abroad.

The sheer costs involved could be enough to dissuade small and medium research facilities to stay clear of the potential liabilities involved with the patent system, and continue releasing information through more traditional means. Nevertheless, there may be a viable solution for the problem of the enforcement of patents held by individual organisations. The problem of enforceability of OSS licenses is similar to what has been described in the previous paragraphs. In software, many small software developers do not have the resources to enforce their copyrights. For that purpose, the FSF recommends that all those

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[129] For more about the economics of the patent system, see ADAM JAFFE & JOSH LERNER, INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT, 64–69 (2004).

[130] There are, however, some ways around this, such as the existence of the European Patent Office, and the tools provided by the Patent Cooperation Treaty ("PCT").

[131] JAFFE & LERNER, *supra* note 129.

[132] This assumption is an extrapolation from what is taking place in the use of open licenses in software and the creative industries.

programmers using their licenses should assign copyright of their works to the FSF because in that way they can enforce the license better in case of infringement.[133] This scheme could be replicated in open science licenses, and has been accepted by CAMBIA as one of its potential roles by stating that BiOS will serve as "a collective defense of the commons and non-assertion of IP rights against other members of the commons."[134] Therefore, collective organisations could be in charge of the enforcement of research held by individuals.

Another possible problem for the use of open licenses of patented technology is that it could be argued that open licenses are incompatible with prevalent patent policy goals. An often stated goal of a patent system is to encourage the distribution of inventions through the utilitarian justification that allows for the economic reward.[135] An open license model might clash with this objective because it would stop inventors from being able to economically recuperate investments in future research related to the patented one, particularly if a non-commercial viral license is used. For example, imagine a patented gene sequence that has been licensed through a copyleft license containing non-commercial viral restrictions. Researchers who would want to patent improvements based on the licensed sequence and then exploit them commercially may find that they would be in breach of their licenses, as they would not be able to sub-license their work commercially because of the viral restrictions. But what if those researchers incurred considerable expenses to produce the improvements? They would have to license their research using a non-commercial clause as well, which would defeat the utilitarian justification for patents. The BiOS License does not appear to have this problem because it allows commercial use of the patented technology, so there may be a case that there cannot be a non-commercial open license for patents.

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[133] Eben Moglen, *Why the FSF gets copyright assignments from contributors*, http://www.gnu.org/copyleft/why-assign.html.

[134] Biological Innovation for Open Science, *Frequently Asked Questions—BIOS Licenses*, http://www.bios.net/daisy/bios/BiOS_licenses/bios_license_faq.html.

[135] Feldman, *supra* note 14, at 120.

The apparent incompatibility of the patent system with open source is well known in the groups that advocate for its implementation. The statement of purpose of the Science Commons project enumerates some of the problems faced by the project in trying to translate the CC ideals into working licenses for works that rely on patent protection.[136] The Science Commons proposal goes as far as to point out that "[m]any of the things that we have learned in forming the Creative Commons do not translate completely to the world of science policy. We dealt primarily with copyright—here the issues would also involve patent and trade secret."[137]

The potential incompatibility between patents and open source licenses is difficult to resolve. Even with the early drafts of the BiOS Licenses, the nature of the patent system seems to offer insurmountable obstacles to the possible adoption of a viable open science license dealing with patented technology. Those industries that are willing to incur the cost of expensive research will want to see their efforts rewarded, and a large patent portfolio will give research-heavy institutions an excellent bargaining position when dealing with other competitors within the industry. The race to decode the human genome has served to demonstrate that there are significant economic interests at play, and this is a fact that will not go away overnight. This is why the best option for smaller research facilities and public interest oriented institutions is to disseminate works through releases into the public domain. This type of dissemination has the effect of widening the accessibility of the research by other small industries. Another effect of the release of materials into the public domain would be to pre-empt future patent applications, because the research has already been made public. Eisenberg explains this tactic:

> In addition to making it difficult for publicly-funded investigators and their institutions to file timely applications for patents, the Bermuda rules also lead to the prompt creation of "prior art" that could potentially defeat patent claims based on similar DNA-sequencing

[136] Joy Davidson, Digital Curation Centre (DCC), *Creative Commons: Establishing a Science Commons*, http://creativecommons.org/science/about/scbackground.

[137] *Id.*

> efforts in the private sector. No one can get a patent on something that was already publicly disclosed before the patent claimant discovered it.[138]

Despite this seemingly watertight solution, there is still a real potential that the information that has been made available for free could be copied and then used to make patent applications about that same material. The chaotic state of patent applications in areas such as software and biotechnology[139] provides a warning that patent offices cannot be trusted in identifying whether a patent application is innovative, or if it is based on significant prior art.

It would be fair to assume that there are too many problems, and it could be suggested that perhaps open science should be scrapped—at least in open science for patents. The lack of licenses at the moment makes the possible implementation difficult, while the few efforts that have been proposed still seem to fall short. Even the strongest proponents of open science and open biotechnology recognise that the movement cannot go forward without viable licenses. Hope comments that:

> Key issues for advancing the open source biotechnology analysis will be developing open source patent licenses and other licenses appropriate for biotechnological subject matter, assessing the importance of higher capital costs in biotechnology development and establishing whether or not there exist secondary markets for biotechnology services or other commercial offerings that might support business models along the lines that have proved successful in the software context.[140]

It is perhaps time to look at different options. Those who believe in ensuring wider access to scientific research and technology should not be daunted by the difficulties encountered, as there may be other solutions that can provide a viable manner to

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[138] Rebecca Eisenberg, *The Public Domain in Genomics* (2000), http://www.law.nyu.edu/ili/conferences/freeinfo2000/abstracts/eisengberg.html.

[139] For more about patent abuse in these two fields, see Eloise Gratton, *Should Patent Protection Be Considered for Computer Software-Related Innovations*, 7 COMP. L. REV. & TECH. J. 223 (2003); Andrews, *supra* note 57; JAFFE & LERNER, *supra* note 129.

[140] Janet Hope, *Open Source Biotechnology?*, http://rsss.anu.edu.au/~janeth/OSBiotech.html.

harness the creative and developmental strengths of the open source model with other ways of dissemination.

V. SPECIFIC PROPOSALS

Apart from the CAMBIA License, the tackling of the patenting problem is short in suggestions, as most of the proponents of the open science and open biotechnology solutions for scientific research usually fail to even tackle the question of the potential problems presented by patents.[141] The solution to the problem may not be in the drafting of new complicated licenses, but in looking elsewhere for inspiration as to new manners of allowing wider access to patented technologies.

In this line, Cukier has suggested that this is not an issue of licenses, but rather suggests that the patenting problems could be overcome through changes in government policy by applying existing national interest patent defenses that are already in use in the United States in the area of defense and health.[142] He comments that:

> US-funded research enables the government to use the resulting technology on a royalty free basis. In the case of the Bayh-Dole Act, the government has 'march-in' rights to take control of a patent it does not believe it being sufficiently exploited. More broadly, the US and its contractors can't be prohibited from using patented technology as a matter of law . . . .[143]

However, this proposal seems to fall short, as it would be very difficult to convince governments in today's IP protectionist environment that there should be some sort of public policy that permits the licensing of some works.

Another novel solution would be to continue using the tried and tested OA and OSS licenses, but to change the clauses to read more generically. For example, instead of using "copyright," the licenses could use "intellectual property," which would cover

[141] Some examples have already been mentioned. For other examples, see Stephen Maurer, Arti Rai & Andrej Sali, *Finding Cures for Tropical Diseases: Is open source an answer*, http://ist-socrates.berkeley.edu/~scotch/ PLOS.pdf.

[142] *See* Cukier, *supra* note 12.

[143] *See* Cukier, *supra* note 12.

patents. However, this seems like an ad hoc patch that fails to provide a real answer to the problems highlighted. This could be solved by using existing software licenses that mention patents. There is one such license: the Apache License (version 2.0),[144] which contains a patent assignment clause that reads:

> Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.[145]

This seems like a viable possibility, as Apache is the dominant web server around the world, with seventy percent of all websites on the net served by Apache software.[146] The data suggests that a direct translation of the Apache license to the realm of patented technology would be possible. However, there should be a cautionary word regarding the Apache License, and it is the fact that it is not the predominant open source license. Out of more than 64,000 open source projects listed in the SourceForge portal, only 344 use this license.[147]

Recent developments have suggested that there may be another way, and that strict licenses are not needed to provide a common pool of accessible scientific data and technology. IBM has made the headlines of every major technology-related news publication

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[144] The license can be found at Open Source, *Apache License, version 2.0.*, http://www.opensource.org/licenses/apache2.0.php.

[145] *Id.*

[146] According to Netcraft's web server survey for March 2005. *See* Netcraft, *March 2005 Web Survey Finds 60 Million Sites*, http://news.netcraft.com/archives/web_server_survey.html.

[147] Data gathered from SourceForge's Software Map. *See* SourceForge's Software Map, http://sourceforge.net/softwaremap/trove_list.php?form_cat=14.

by stating that it will not enforce 500 software patents that it owns if they are used by open source software projects.[148] This unprecedented move has been achieved through a clever use of contract law. IBM has published a legally-binding promise not to enforce a number of their patents to those software projects that are released to the public through a license approved by the Open Source Institute.[149] This element of IBM's pledge is very important, as it gives a tight definition of what will be an open source project. The definition reads:

> Open Source Software is any computer software program whose source code is published and available for inspection and use by anyone, and is made available under a license agreement that permits recipients to copy, modify and distribute the program's source code without payment of fees or royalties. All licenses certified by opensource.org and listed on their website as of 01/11/2005 are Open Source Software licenses for the purpose of this pledge.[150]

The document goes on to promise that IBM will not assert any of the listed patents in the United States, or its counterparts worldwide, against open source projects, defined as above.[151] The document ends with a list of the 500 patents. This announcement should be met with some skepticism, as IBM has a considerable software patent portfolio, and was awarded more than 3000 patents in 2004 alone.[152] One should also be skeptical about the possible legal validity of such promise.

The main question about the validity of the pledge is centred on the question of its classification within contractual law. In this document, IBM is making a unilateral promise that stands on the assumption that it can be met by those who qualify as an open source developer. This promise does not require an obligation per se, it simply promises not to sue a group of people that fulfill

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[148] *IBM frees 500 software patents*, BBC NEWS, Jan. 11, 2005, *available at* http://news.bbc.co.uk/1/hi/technology/4163975.stm.

[149] The list of approved licenses can be found at Open Source, *The Approved Licenses*, http://www.opensource.org/licenses/.

[150] IBM, *IBM Statement of Non-Assertion of Named Patents Against OSS* (2005), http://www.ibm.com/ibm/licensing/patents/pledgedpatents.pdf.

[151] *Id.*

[152] IT Facts, *IBM, Matsushita, Canon and HP received the most US patents in 2004*, http://www.itfacts.biz/index.php?id=P2370.

certain characteristics. In this manner, it is not so different than a retailer that promises to give free CDs to those who bring a coupon to their store. The issue of unilateral promises is an area of the law that varies from one jurisdiction to another. In some Common Law systems, the question of unilateral promises has often been dealt with as an issue of contract formation and consideration.[153] However, the landmark case of *Carhill v. Carbolic Smoke Ball Company*[154] established that a unilateral promise that is accepted through the performance of an act is valid. Scotland does not have a problem with acceptance; therefore unilateral promises are much less of an issue and have to be considered generally valid.[155] Other European countries have different rules for the acceptance of unilateral promises,[156] but countries like Germany[157] and France[158] allow some models of obligations arising from unilateral promises. This tends to give strength to the validity of IBM's promise.

IBM's non-enforcement promise is a very practical and seemingly valid solution that can be applied to all other sorts of patents, and it could prove to be an effective tool to solve the problematic application of OSS models to patented technologies. This could work for individual scientists or research institutions that are interested in maintaining their intellectual property, but that want to allow access to their patented material to specific recipients. These institutions could publish their own promise not to assert their patent portfolio, or a selected list of patents, as long as the users fall into a specified category of beneficiaries. It is important that the patent owner identifies clearly the intended users of the technology, and defines it unequivocally in the document. A

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153 *See, e.g.*, Paul Mitchell & John Phillips, *The Contractual Nexus: Is Reliance Essential*, 22 OXFORD J. LEGAL STUD. 115, 118–24 (2002).

154 [1893] 1 QB 256 (C.A.).

155 There are a few exceptions, such as the requirement that the promise should be in writing. For more about promises in Scotland contract law, see HECTOR MACQUEEN & J.M. THOMSON, CONTRACT LAW IN SCOTLAND, 63–69, (2000).

156 For more about European applicability of unilateral promises, see THE ENFORCEABILITY OF PROMISES IN EUROPEAN CONTRACT LAW, (J. Gordley ed., Cambridge Univ. Press 2001).

157 Burgerliches Gesetzbuch [BGB] § 657.

158 As shown in Cass. Civ. 1re, (Oct. 16, 1995).

promise that allows use in developing countries would be useless, unless it is accompanied by a clear definition of what constitutes a developing country, and what sort of users in those countries would benefit from the pledge. A possible clause could thus read: "this pledge will benefit researchers based in a Least Developed Country as defined by the United Nations Conference for Trade and Development;" or "for the purpose of this promise, developing country will be defined as a country that is listed as having low human development in the 2004 Human Development Report by the United Nations Development Programme." Another important element to add is that the patent owner could generate a web form where users who fall into the definition could register as such, which would have the added benefit that the owner would have a better idea of who is using the technology.

One of the main advantages of the use of a unilateral promise is that it helps to focus the access to scientific research to those who the patent owner would not consider to be a commercial threat or potential competition, which would erase some of the concerns about the possible incompatibility of open source models with the expenses and commercial value of research. This solution is not a licensing scheme; therefore, it eliminates some of the more complex contractual chains of distribution that can be found in viral contracts. Researchers could also gain in the knowledge that there will be a certain amount of knowledge that can be used without fear of infringement.

VI. DRAFT PROMISE

Preamble

[This space can be used to indicate the purpose and the rationale behind the promise]

Definitions

[This space will contain a series of strict definitions of the beneficiaries. Some examples are provided]

"Technology": the list of patents included in the Annex.

"Owner": The patent owner, [INSERT NAME].

"Beneficiary": Any organisation that is a listed participant of BioForge projects as of [INSERT DATE].

Promise

The Owner hereby promises not to enforce any of the listed Technology against Beneficiaries that have registered their intent to use the Technology at the following address [INSERT FORM ADDRESS].

Warranty

The Owner certifies that the Technology is owned by him/her [or that it has specific permission to issue the promise]. The Owner also certifies that the Technology is not subject to litigation as of [INSERT DATE]. The Owner presents the Technology "as is," and makes no warranty as to the accuracy of the information contained in the patent application.

Limitation of Liability

Subject to any liability which may not be excluded or limited by law, the Owner will not be held liable for incidental, consequential, or indirect loss or damage howsoever and whenever caused to the Beneficiary.

Annex

[Table of patents, listing patent number, awarding office, beneficiary and title (or brief description)]

VII. CONCLUSION

The issue of access to scientific research is becoming one of the most important issues of our time. The direction of the flow of knowledge rests greatly on the problem of the ownership of technology. One of the grandest ideas in recent years is the use of intellectual property tools to protect certain parts of human knowledge, something that is managing to generate shared knowledge, a common pool of technology and research that can be accessed by all; a common space where the information flows with fewer restrictions than in an entirely proprietary model.

This common space has already been experimented with and explored within the free software and open source software communities. The non-proprietary software experiment has demonstrated that open development models are viable and sometimes even commercially successful. Amongst these models, one of the most interesting licenses is that offered by so-called copyleft licenses, those licenses that allow software to be transferred with the insurance that the source code will remain open, with the caveat that anyone who redistributes the software, with or without changes, must pass along the freedom to further copy and change it.

However, software development is not the only area in which this licensing model could be applied. The viral nature of copyleft licenses has generated a considerable amount of interest in circles that transcend software development. The idea of sharing materials is not new, and has been made more evident by the chaotic and sometimes anarchic nature of the Internet. However, shared materials tend to suffer from the possibility of third parties who use the freely acquired information to turn them into proprietary works. That is why many different organisations are turning to the copyleft model to protect works that are being freely shared online.

This article has explored the application of non-proprietary software licenses to scientific research—particularly academic publications, scientific databases, and patented technologies. To do this, several different licensing models have been explored. It is clear that copyright materials are well suited for this experiment, and the area of scientific publications shows special promise for the future. Unfortunately, other types of scientific outputs present more challenges to those involved. Costly research and development have produced entire fields of study that are not suitable to adopt the open source ideals. Although the trailblazing efforts of CAMBIA, HapMap and the BiOS Licenses must be applauded and recognised, the author feels that there is much to be done to ensure access to expensive technology to the widest possible audience. IBM's unilateral promise gives researchers a model to emulate to ensure this objective. It is feasible to apply this document to almost all investigation efforts that result in a patent.

The author recognises that this is just a draft proposal, but it is hoped that others can continue to add to this idea if it is found to be useful.[159] In the best spirit of the Bazaar, and paraphrasing Linus Law, given enough eyeballs, all license bugs are shallow.

[159] Comments about this draft are welcome, please send them to a.guadamuz@ed.ac.uk.